

A HEALTHY OUTLOOK FOR THE BLOWER DOOR INDUSTRY

As prices are slashed, more blower doors are being sold than ever before.

The market for infiltration test equipment has grown dramatically since the first blower door was commercially produced in the U.S. in 1978. Combined revenues from blower door sales and testing are nearing \$10 million per year. Today, there are more than a dozen manufacturers and hundreds of firms using blower doors in the field. Given the increasing recognition of their usefulness and the fact that prices are dropping, blower doors are likely to become a far more common tool for measuring the leakage characteristics of homes. An article in the March issue of **EA&R** discussed technical issues in buying and using a blower door. This second of three articles on blower doors describes trends in blower door sales and marketing strategies for manufacturers.

Marketing Update: Sales Are Up!

Once strictly the domain of energy researchers, blower doors are now becoming an affordable tool for the residential energy contractor. A small but growing industry has emerged to meet this need. **EA&R** identified 13 such firms currently manufacturing blower doors (in the U.S. and abroad) [1]. At least 16 blower door models are available at prices ranging from \$870 to \$3,400.

How many blower doors are now in use? At least 1,300 doors have been sold to date by the U.S., Canadian, and Swedish manufacturers that we surveyed, with 390 sold last year alone. Thus, 30 percent of all blower doors now in use were sold within the past year. Our survey results support various estimates of the number of blower doors in use. Don Stevens, of the *Energy Business Association* of Washington State, estimated that there are between 1,000 and 2,000 blower doors now deployed in the U.S., and that annual sales

for the top four firms number around 100 doors each. Larry Eddington, of *Air Quality Labs*, of Spokane WA, guessed the total number at 600-800.

The industry is expanding: more blower doors are being sold than ever before, and prices are being slashed. Most manufacturers are increasing marketing efforts. They agree that buyers are more sensitive to price differences now that there is a wider selection of models. Most

En man klarar lätt hela utrustningen.

Den väger bara 18 kg.

Jet-metoden är konstruerad med tanke på att vara lätthanterlig. Den har tryckstyrt hastighetsreglage – ingen tung transformator behövs; och de olika komponenterna har valts med tanke på lätthanterlighet, driftsäkerhet och kapacitet!

Jet-metoden har kapacitet så det räcker!

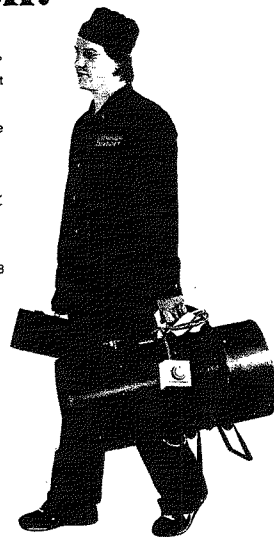
Mätområde: 200–2900 m³/h.
Luftomsättningen i ett hus bör ej överstiga 3 gånger rymden/timme för att kunna godkännas. Hur detta fungerar i praktiken ser Du av följande exempel:

Ett hus har en golvyta om 200 m²
takhöjd 2,4 m. dvs 200x2,4 = 480 m³.

Då luftomsättningen ej skall överstiga 3 ggr/rymden, får vi:

3x480 = 1.440 m³.

Jet-metoden kan alltså fastställa ett läckage som är mer än det dubbla.



Tätningsprovet är konstruerad och tillverkas av Mekatekonomi i Västerås. De plasträttigheter som marknadsföres av Värmeekonomi har utvärderats med hjälp av kvalificerade yrkesmän i branschen. De bygger på mångårig erfarenhet och teknisk utveckling. Du kan därför lita på att den utrustning Värmeekonomi erbjuder på ett effektivt sätt löser dina och underlättar arbetet.

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Värmeekonomi

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– sotarens varuhus med värmeekonomisk utrustning!

[1] (see Table 1 in "Blower Doors: Infiltration is Where the Action Is", **EA&R**, Mar/Apr '86)

Two Swedish manufacturers have sold hundreds of blower doors since the late '70s.



"The best way to check your house for drafts is to walk around wet-nude with a clip board, taking notes."

By Richard Guindon
(c) News Group Chicago, Inc.
Courtesy of News America Syndicate

firms, however, say that sales are stable or improving. Don Stevens says that the development of mandatory or voluntary standards holds promise for significant sales increases (see box on incentives).

EA&R estimates that blower door sales constituted a \$1.2 million industry in 1985—assuming an average equipment sales price of \$3,000. The market for blower door testing, via the house doctor service, is not as easy to quantify. First one must account for the number of tests performed and price per test. Subsidized tests, such as those performed by community action programs, also confuse the estimate. Franchise sales and weatherization services recommended by blower door test results must also be counted. [2]

To expand their market, manufacturers are offering a much broader array of options, including more attractive doors, less expensive and less sophisticated models, and marketing services, such as workshops and videotapes for buyers on sales and use of blower doors. The shift to lower-priced doors is often accomplished by using uncalibrated fans. *Infiltec*, for example, has just announced two

new doors, both priced under \$2,000. *Minneapolis Blower Door* developed a calibrated model that sells for \$1,250, to replace their original model, which sold for \$2,500. According to Gary Anderson, the new *Minneapolis Blower Door* is at least as accurate as the old model. "We refined the design and manufacture of the system so that it is simpler to build and simpler to use."

Another marketing development is the blower door franchise, a concept that gives the manufacturer a steady market for blower door supplies and related weatherization equipment. These franchises are intended for weatherization firms. According to David Brown, *Princeton Energy Partners* sells franchises for \$15,000. This price includes a territorial agreement, extensive training, and the use of marketing materials. Brown recommends a complete \$20,000 equipment package: an AGA 100 infrared camera, Gadzco blower door, Lynn electric combustion analyzer, IMC digital thermometer and a smoke gun. "The use of the full set of equipment and the training program are absolutely crucial to savings," stresses Brown. "We do not guarantee savings, but we generally get results in the 15 to 25 percent range for retrofit housing." Although most do not offer full franchises, some manufacturers provide sales support materials. *Retrotec*, for example, offers licensed

[2] Assuming that forty tests are performed per door per year for each blower door now in the field, and the average cost per test is \$150, annual revenues would be roughly \$8 million.

dealerships and has just opened a training center in Indianapolis. The dealer fee of \$2975 includes 35 days of training, ventilation software with a Sharp computer and printer, and a reliable supply of weatherization materials. The training center is open to anyone interested in learning about blower doors testing. A three-day course that costs \$300 is also available.

Being in Business

The potential for successful blower-door businesses seems great, and the cost of entry is low compared to most businesses. The blower door itself is the most expensive component and can often be purchased in installments. Inventory and staff requirements are minimal, and materials costs for blower door tests and weatherization are low.

The price of a typical blower door test is about \$100-200, and the test requires about 2-person hours of time on-site; however, this does not include weatherization work that usually accompanies a blower door test. One firm in Cincinnati charges by the size of the house: \$0.35-0.50 per square foot (\$500-750 for a 1500 ft² house) for the blower door test and the weatherization work necessary to reduce leakage area by 50 percent.

Several blower door users and manufacturers also perform related energy conservation activities. The following is a list of examples:

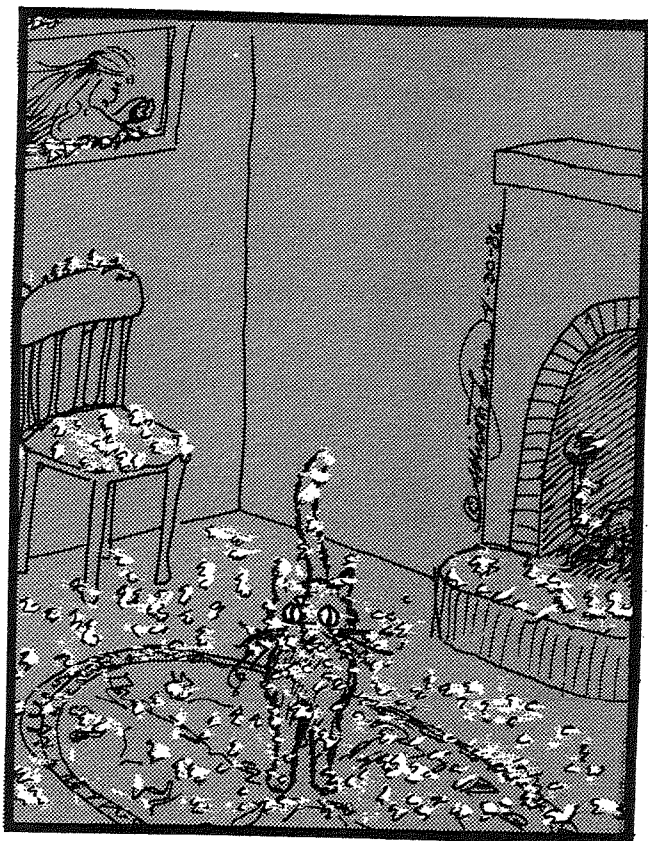
- *Heatnapper*, Omaha, NE, is in the gas furnace and vent-damper business and sells solid-state controls for residential and commercial building heating and cooling systems.
- *Your Energy Systems*, Nashville, TN, is active in HVAC sales and residential weatherization.
- *Air Quality Labs*, Spokane, WA, sells a full line of retrofit products and air-to-air heat exchangers.
- *Infiltec*, Falls Church, VA, consults to private or government agencies who are developing blower door standards or test guidelines. They also sell energy software and radon monitors.

Low-Income Housing Applications

The use of blower doors is being promoted by many community action programs (CAPs) in the federally-supported low-income weatherization (LIW) program. This is not surprising given that

low-income homes are often very leaky. The primary goal of CAPs contractors is to detect and seal major air leaks, as opposed to precisely determining the leakage area or number of air-changes per hour. Thus for a typical LIW agency or contractor, two or three low-cost (around \$1,000) uncalibrated units will be more productive than a single state-of-the-art precision door.

Rob Hockinson, of the Ramsey Action Program in Vadnais Heights, Minnesota, described how their auditors use blower doors, "If a weatherization crew feels that they can't find leaks by visual inspections, they'll bring a blower door to the house. We perform about 500 tests per year—up to six or eight per day. It takes us about one hour to do a test with a two-person crew." They use pressurization tests if they're trying to find attic bypasses—air leakage into the attic from the living area—and depressurization tests in combination with IR cameras for finding leaks inside the house. Hockinson says that pre- and post-retrofit pressure tests add a healthy element of competitiveness among the crews. He also noted that they would prefer to have digital readouts on their equipment, because everyone interprets the gauges somewhat differently.



Another cat gets blown away, as Joe forgets to remove the ashes from the fireplace before depressurizing the house.

New Markets

Manufacturers unanimously agree that several potential markets remain undeveloped. Among the promising future blower door users are:

- **Military Agencies:** The U.S. Air Force has initiated a house-doctoring program for its 200 bases around the world. Blower door tests have already been performed at 20-30 of these bases. Part of the program includes the development of elaborate test guidelines. The Air Force is subcontracting the blower door work. In contrast, the Navy plans to buy 50-70 blower doors to test their buildings from Yokohama to Iceland, and the work will be done by in-house crews.
- **Solar contractors:** Many solar firms anticipate less business as a result of recent cuts in solar tax credits. David Saum, president of *Infiltec*, says, "Business has gone bananas since the first of January [when the credits were eliminated]." A number of solar firms are switching to air infiltration and weatherization work—an opportunity to work on solar homes they designed in years past.
- **Low-Income Weatherization Agencies:** The thousand CAPs across the country also constitute a large potential market. The Minnesota Valley Action Council, for example, purchased seven blower doors from *Eder Energy* in 1984 and has since used them on 700 weatherization jobs. The State of Montana recently purchased a *Minneapolis Blower Door* for each of its eleven CAPS, and three of these agencies have already bought an additional blower door. However, the future level of support for LIW activities is in question, given the Gramm-Rudman budget cuts.

- **Utilities & Local Governments:** Major state- and county-level efforts are under way to conserve electricity and avoid the construction of costly new power plants, and utilities may turn to the blower door as a tool to insure cost-effective, quality retrofits. For example, the City of Austin provided blower door checkups on over 8,000 homes last year (see *EA&R*, Nov/Dec '85, "Austin's Conservation Power Plant").
- **Home Builders:** Blower doors can perform an important role in quality control both during and after home construction. The tests are conducted after drywall installation and before trim work and painting. While depressurizing a home, one builder of energy-efficient modular homes found leaks in prefabricated windows he was installing. He took his results to the manufacturer and had the problem corrected. Gary Nelson, in Minneapolis, has visited 25 low-energy homes after four years of occupancy. By combining blower door tests and infra-red thermography, he has identified an embarrassing number of shortcuts taken by the builders (e.g., faulty vapor barrier installation and insulation deficiencies).

Other potential users are: insulation and window contractors, infiltration and indoor air quality researchers, home appraisers, property owners and managers, and fire insurance analysts (leaky buildings burn faster).

Policies and Programs Affecting the Market

The success of blower door businesses (manufacturers and users alike) is sensitive to government and utility conservation policies. Bill

Incentives for Blower Door Tests

The potential use of blower doors in the Northwest is great. For example, nearly 15,000 new homes are built in the Pacific Power and Light (PP&L) service area each year. The utility *may* offer a special sales promotion package and/or cash incentives for homes pressure-tested with doors certified by the Energy Business Association, a group working to develop a voluntary certification procedure in the Northwest.

This certification procedure would allow the utility to offer incentives for the use of blower doors without the need to develop its own test procedures. The rebate would reduce the price of a \$600-800 test and weatherization job by about \$200. In another development in the same region, the Northwest Power Planning Council may soon require blower door tests on all homes built to their new Model Conservation Standards (MCS). For more information on the EBA project, contact Don Stevens, Energy Business Association, 911 Western Ave., #300 A, Seattle, WA 98104, tel: (206) 622-7171.

The Non-Blower Door, Blower Door: AC Pressurization

Within six months to a year, a new kind of infiltration test instrument will be available—it's called "AC Pressurization." The device mounts in a doorway, much like the traditional blower door. However, instead of using a fan to move air through the building, AC-Press employs a large piston-like panel that oscillates in and out of the room at a rate of one to four times per second. The result is continuous pressure fluctuations from which leakage area can be calculated.

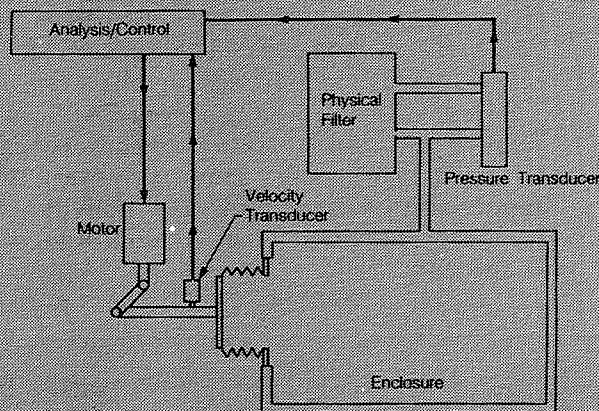
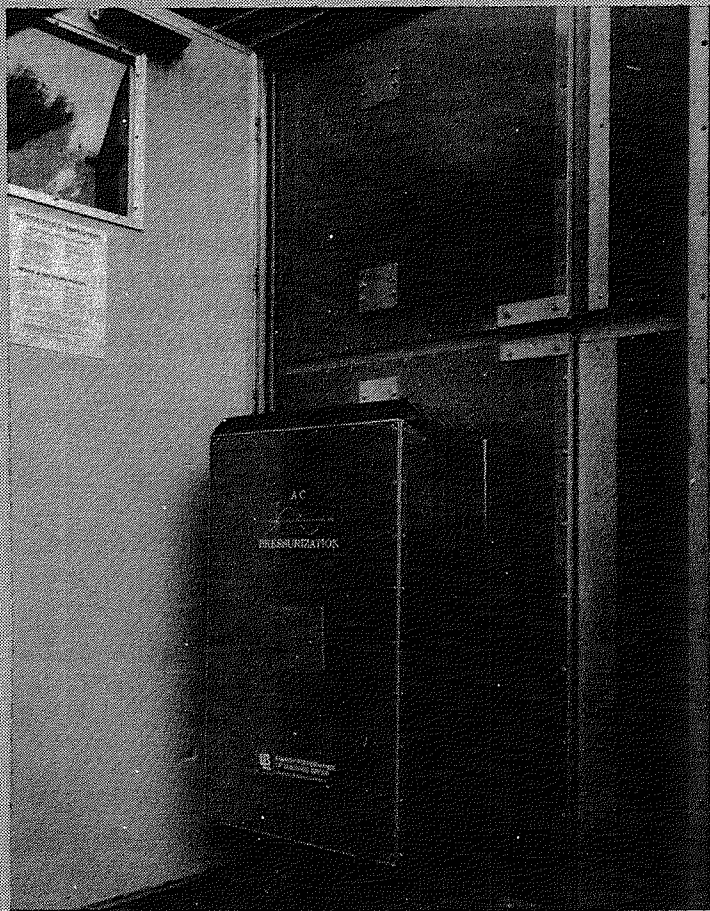
The advantage of AC-Press over a conventional blower door is that 1) cold air need not be blown through the home during wintertime tests, 2) the results are less vulnerable to wind disturbance, 3) the tests are quieter and generally less disruptive to the occupants, 4) the air-change-rate is calculated at 4 pascals instead of the 50 pascal measurement made by blower doors—so the result may be more accurate, and 5) the leakage area is determined instantly.

The disadvantages are 1) that it has been difficult so far to detect very *large* leaks, such as open windows or open fireplace dampers and 2) that without the large flows of air, it is impractical to use smokes-ticks or IR cameras in conjunction with AC-Press to detect leaks. The second problem can be inexpensively remedied, however, by using a simple window fan and smokestick before or after the AC-Press test for leak detection.

Researchers at Lawrence Berkeley Laboratory have conducted preliminary comparisons of conventional blower doors with AC-Press in six homes. Blower door leakage area measurements ranged from 3-24 percent higher than those for AC-Press, with an average of 14 percent. It is important to remember that the difference does not indicate *which* of the two instruments is more accurate.

The first AC-Press doors will probably sell for around \$10,000 and be used by researchers. Prices are expected to drop by 2/3 as the design and assembly process is streamlined.

For more information on AC-Press contact: David Saum of *Infiltec* at (703) 820-7696.



Left: Photograph of the AC-Press infiltration test unit, with its large, piston-like panel that oscillates in and out of the room at a rate of one to four times per second. **Above:** A schematic diagram of the AC-Press.

French, of *Your Energy Services*, noted that the Tennessee Valley Authority (TVA) sets the trends in his area, "TVA's the biggest bear in the woods around here, and they're currently not behind blower doors." Consequently, not much work with blower doors is done in their service territory. At one time a number of blower doors were in use in British Columbia. The number has dropped substantially since government weatherization funding has been cut, and since the R-2000 program, which requires blower door testing, has been scaled back. Industry and utility efforts in the Pacific Northwest may encourage blower door manufacturers and users by giving cash incentives for blower door tests (see box on incentives). Yet another possible boost to the industry may come from some of the two billion dollars in Petroleum Violation Escrow Account (PVEA) funds that Exxon must return to the public via conservation programs.

CAPs are confronted with a situation that may limit their use of blower doors. Because job creation is among the top priorities for CAPs, capital expenses are expected to be relatively small in proportion to wage payments. Federal guidelines for CAP weatherization work require that 60 percent of the funds be spent on materials and 40 percent on labor. The large capital costs and relatively low labor inputs required for blower door tests may force CAPs to find innovative methods for purchasing this useful piece of equipment.

Research Agenda: Problems Needing Solutions

The intricacies of using blower doors and interpreting the results are far from being perfectly understood. Here are some of the issues at the leading edge of infiltration testing.

1. **Design Innovations:** Entirely new methods of infiltration testing are now being developed. AC Pressurization, whereby the fan is replaced by an oscillating piston, is one example (see box on AC-Press).
2. **Testing Multi-family buildings:** Over one third of the U.S. housing stock are multi-unit buildings. Blower doors are now being tested in these structures, but the measurements are much more difficult to obtain—several doors must be used in parallel to detect leakage *between* apartments as well as to the outdoors.
3. **Effect of weather conditions on results:** Wind, temperature, and even humidity can skew

test results. Techniques need to be refined to either adjust for these effects or to determine that tests simply must not be performed under certain weather conditions.

4. **Repeatability of tests:** A blower door test should be repeatable. If pre- and post-retrofit tests are made several months apart, an "observed" leakage reduction may, for example, be due only in part to the retrofit and in part to swelling of the house's wood (which can temporarily seal small cracks under high humidity conditions) during the follow-up test. Differing styles of conducting the test or interpreting the results may also result in different results.
5. **Dollar savings:** Every blower door user wants to tell her client how a certain reduction of leakage area translates into annual dollar savings. But this kind of calculation is difficult to make. (It is nonetheless a fairly widespread practice)
6. **Standards development:** In the U.S. and abroad, efforts are underway to develop accepted standards for blower door equipment and certification for its user. The few standards now in use are not identical.

Blower Door Pitfalls

Currently, there are few if any safeguards for the homeowner who hires someone to measure her home's leakage. The use of computers and complicated formulae enable the house doctor to easily falsify test results. The incentive to do so may be rooted in a promise to reduce leakage by a predetermined percentage, or pressure on a manager of a municipal weatherization project to "succeed" in plugging leaks. Future standards and testing guidelines should address the difficulties of insuring *honest* leakage measurements.

Researching Blower Doors

In our efforts to bring a few good blower door articles to the EA&R readership, we have learned a thing or two about what it's like for the prospective blower door customer—the firm that wants to buy a door. Most sales literature is meager, considering the large investment involved. After wading through the manufacturers' thick sales packets, the blower door novice may be frustrated by the lack of accurate and complete information. Finally, blower door manufacturers, especially the smaller ones, can be hard to contact, and, at least in one case, have been known to skip town.

Conclusions & Outlook

There are three important actors in the \$10 million per year blower door market: the manufacturer, who brings new technologies into use; the user, who actually provides blower door services; and the energy policy community. For the user, in particular, the blower door test is a "foot in the door," that can lead to a profitable contract for the retrofitter and a cost-effective retrofit for the homeowner. For all parties, the market seems healthy. The number of blower doors in use increased by 30 percent last year, and the selection of commercially available home pressurization equipment has never been greater.

New technologies, standards, and marketing efforts point to a bright future for blower doors. Among the most important users are energy researchers who continue to contribute to our understanding of infiltration theory. They will assist future blower door contractors by increasing measurement accuracy, developing better performance indicators (e.g., leakage area, air-changes per hour), improving the design of blower door equipment, and linking the results to human comfort and indoor air quality problems.

Currently, the largest scale uses of blower doors stem from government-supported programs, such as the federal Low-Income Weatherization Program. Competition has led to a broader range of equipment, lower-priced blower doors and scores of small private "house doctor" firms. Active support of federal, state, and county agencies may be crucial to getting this relatively new industry squarely on its feet.

Important trends include 1) a shift toward lower-priced doors to meet the needs of small contracting firms or low-income weatherization agencies (i.e., leak detection without additional diagnostics); 2) marketing and franchise options; 3) diversification of firms into other conservation activities, 4) the need to introduce more quality control and consumer protection into the leakage measurement process, and 5) the appearance of entirely new infiltration testing technology like AC Pressurization.

— Evan Mills

Correction: In the blower door specifications table in the March issue of **EA&R** we mistakenly listed the warranty for the *Eder Energy* blower doors as 1 month. The correct warranty period is 12 months for the fan modules (including motors, blades, guards and cords).

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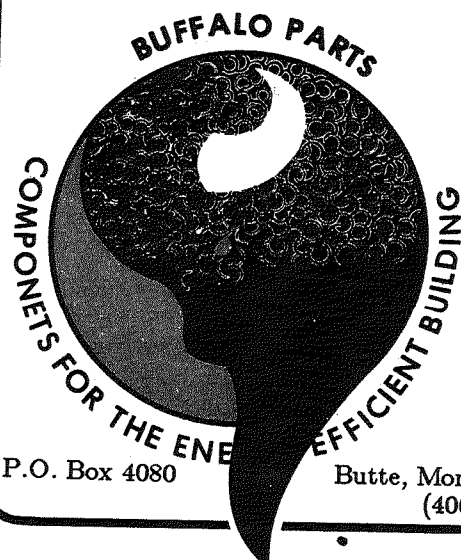
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